Amendments to the Claims:

This listing of the claims will replace all prior versions, and listings, of claims in the application:

Listing of the Claims:

1. (Currently amended) A fuel cell system comprising:

a reaction vessel having a catalyst carried in the vessel for promoting an endothermic reaction, the reaction vessel being constructed and arranged to allow endothermic reactants to be charged into the vessel, and further comprising at least a first and a second of heat exchanger device spaced apart from each other and carried within the vessel, and wherein the first and second heat exchanger devices are constructed and arranged to be independently controlled from each so that heat transferred by the heat exchanger devices to the catalyst, and the temperature of the catalyst, may be varied at different locations within the reaction vessel corresponding to the location of the first and second heat exchanger devices, and wherein the reaction vessel comprises a plurality of parallel substrates, each of the substrates having a first and a second surface, and an endothermic reaction catalyst overlying the first surface, and an exothermic reaction catalyst overlying the second surface, and wherein each of the substrates is constructed and arranged to transfer heat from the second surface to the first surface.

2. (Currently amended) A fuel cell system as set forth in claim 1 wherein the reaction vessel is constructed and arranged so that exothermic reactants may be charged into each heat exchanger device and wherein the exothermic reactants comprising a fuel and an oxidant, and wherein each of the heat exchanger devices includes at least one combustion chamber, ~~and wherein a catalyst for promoting chemical combustion is carried in each combustion chamber,~~ and wherein at least one of the fuel and the oxidant are selectively charged to each combustion chamber in a controlled amount so that the heat generated by each of the heat exchanger devices may be varied as desired.

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3. (Currently amended) A fuel cell system comprising:

a reaction vessel including a plurality of endothermic reaction sections, and a plurality of heat transfer devices, wherein each endothermic reaction section has a heat transfer device associated therewith to supply sufficient heat to control the temperature profile of the associated endothermic reaction section within a predetermined range, and wherein each endothermic reaction section comprises a substrate shared by an adjacent heat transfer device.

4. (Original) A fuel cell system as set forth in claim 3 wherein the endothermic reaction sections are spaced apart and wherein the heat transfer device is positioned between two spaced apart endothermic reaction sections.

5. (Original) A fuel cell system as set forth in claim 4 wherein each heat transfer device comprises at least one catalytic combustion chamber having a catalyst therein for combusting a combustion fuel mixture in the catalytic combustion chamber.

6. (Original) A fuel cell system as set forth in claim 5 further comprising a fuel cell stack, and wherein the combustion fuel mixture comprises anode and cathode exhaust from the fuel cell stack.

7. (Original) A fuel cell system as set forth in claim 3 wherein each endothermic reaction section includes a catalyst supported on at least one selected from the group of a ceramic and metal monolith.

8. (Original) A fuel cell system as set forth in claim 3 wherein each of the endothermic reaction sections includes a catalyst supported on a foam.

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9. (Original) A fuel cell system as set forth in claim 3 wherein the reaction vessel is constructed and arranged so that the exhaust from a first endothermic reaction section flows over a heat transfer device before flowing into a second endothermic reaction section.

10. (Withdrawn) A system comprising:

a combination reaction vessel having multiple staged catalytic combustion chambers and a plurality endothermic reaction chambers and wherein each endothermic reaction chamber has a combustion chamber adjacent thereto so that heat generated in a combustion chamber is transferred to the adjacent endothermic reaction chamber.

11. (Withdrawn) A system as set forth in claim 10 wherein each catalytic combustion chamber has a plurality of reactant charge openings for supplying at least one reactant to the catalytic combustion chamber, and wherein the charge openings are positioned within the catalytic combustion chamber to provide a substantially uniform temperature along the length of the catalytic combustion chamber.

12. (Withdrawn) A system as set forth in claim 11 further comprising a fuel supplied to the endothermic reaction chambers for reforming the fuel in the endothermic reaction chamber and producing hydrogen.

13. (Withdrawn). The system as set forth in claim 10 further comprising a substrate separating adjacent endothermic and exothermic reaction chambers, and an endothermic reaction catalyst in the endothermic reaction chamber and overlying the substrate, and an exothermic reaction catalyst in the exothermic reaction chamber and overlying the substrate.

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14. (Currently amended) A fuel cell system comprising:

a reaction vessel integrating an exothermic reaction and an endothermic reaction, the reaction vessel including a ~~substrate~~ plurality of substrates, each of the substrates having a first and a second surface, and an endothermic reaction catalyst overlying the first surface, and an exothermic reaction catalyst overlying the second surface, and wherein ~~the substrate~~ each of the substrates is constructed and arranged to transfer heat from the second surface to the first surface.

15. (Original) A fuel cell system as set forth in claim 14 wherein the first and second surfaces are located on opposite sides of the substrate.

16. (Original) A fuel cell system as set forth in claim 14 wherein the substrate has a substantially flat planar configuration.

17. (Currently amended) A fuel cell system comprising:

an integrated exothermic and endothermic reaction vessel having ~~an~~ a plurality of exothermic reaction ~~chamber~~ chambers and ~~an~~ a plurality of endothermic reaction ~~chamber~~ chambers and a substrate separating one of the exothermic reaction ~~chamber~~ chambers from one of the ~~and~~ endothermic reaction ~~chamber,~~ chambers adjacently positioned thereto and wherein the substrate has a first surface facing inward toward the exothermic reaction chamber and further including an exothermic reaction catalyst overlying the first surface, and wherein the substrate has a second surface facing inward toward the endothermic reaction chamber and further including an endothermic reaction catalyst overlying the second surface, and wherein the integrated reaction vessel is constructed and arranged so that reactants may be selectively supplied to the exothermic reaction chamber to produce reaction products and heat, and so that at least a portion of the heat is transferred through the substrate to the second surface to drive an endothermic reaction occurring in the endothermic reaction chamber.

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18. (Currently amended) A fuel cell system comprising:

an integrated chemical combustion and fuel reformation vessel having a chemical combustion ~~chamber~~ chambers and a fuel reformation ~~chamber~~ chambers and a substrate separating ~~the~~ an adjacent chemical combustion chamber from ~~the~~ an adjacent fuel reformation chamber, and wherein the substrate has a first surface facing inward toward the chemical combustion chamber and further including a combustion catalyst overlying the first surface, and wherein the substrate includes a second surface facing inward toward the fuel reformation chamber and further including a reformation catalyst overlying the second surface, and wherein the integrated chemical combustion and fuel reformation vessel is constructed and arranged to supply combustion reactants to the chemical combustion chamber for reaction therein to produce combustion products and heat, and so that at least a portion of the heat is transferred through the substrate to the second surface in an amount sufficient to selectively reform a desired amount of the fuel supplied to the fuel reformation chamber.

19. (Withdrawn) A system comprising:

a combination reaction vessel comprising:

a plurality of spaced apart endothermic reaction chambers wherein each endothermic reaction chamber includes an endothermic reaction catalyst therein;

a plurality of spaced apart exothermic reaction chambers wherein each exothermic reaction chamber includes an exothermic reaction catalyst therein;

wherein each of the exothermic reaction chambers is positioned between two endothermic reaction chambers and constructed and arranged so that the heat generated from an exothermic reaction in the exothermic reaction chamber is transferred to an adjacent endothermic reaction chamber.

20. (Withdrawn) A system as set forth in claim 19 wherein each exothermic reaction chamber is defined in part by a wall that is shared with an adjacent endothermic reaction chamber.

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21. (Withdrawn) A system as set forth in claim 20 wherein the exothermic reaction catalyst overlies the wall.

22. (Withdrawn) A system as set forth in claim 20 wherein the endothermic reaction catalyst overlies the wall.

23. (Withdrawn) A system as set forth in claim 19 wherein the exothermic reaction catalyst is a catalyst to promote the combustion of an exothermic reaction fuel with oxygen supplied to the exothermic reaction chamber.

24. (Withdrawn) A system as set forth in claim 19 wherein the endothermic reaction catalyst is a catalyst to promote the reformation of a reformation fuel supplied to the endothermic reaction chamber.

25. (Withdrawn) A system as set forth in claim 19 wherein a plurality of charge holes are provided and positioned along a length of each exothermic reaction chamber and wherein one of the exothermic reaction fuel and oxidant is charged into the exothermic reaction chamber utilizing the charge holes.

26. (Withdrawn) A system as set forth in claim 25 further comprising a charge manifold having a plurality of charge pipes extending therefrom and wherein each exothermic reaction chamber includes one of the charge pipes and wherein said charge holes are provided along the length of each charge pipe and wherein an exothermic reaction fuel is charged into a combination reaction vessel through the charge holes.

27. (Withdrawn) A system as set forth in claim 25 wherein the exothermic reaction fuel comprises hydrogen and wherein the charge holes are positioned and configured in each exothermic reaction chamber so that the concentration of hydrogen and the temperature in each exothermic reaction chamber is such that flame combustion is prevented.

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28. (Withdrawn) A system as set forth in claim 26 further comprising a valve associated with each charge pipe and further comprising a valve controller for selectively controlling the amount of fuel charged to each exothermic reaction chamber.

29. (Withdrawn) A system as set forth in claim 28 further comprising sensors positioned in the exothermic reaction chambers to monitor the exothermic reaction conditions therein and operatively connected to the valve controller so that the amount of reactants being charged to the exothermic reaction chambers can be selectively controlled.

30. (Withdrawn) A system as set forth in claim 26 wherein a plurality of exothermic reaction chambers are arranged in an adjacent side-by-side configuration, and wherein each charge pipe separates adjacent side-by-side exothermic reaction chambers.

31. (Withdrawn) A system as set forth in claim 26 wherein a plurality of exothermic reaction chambers are arranged in an adjacent side-by-side configuration, and further comprising a flow direction header at the end of each exothermic reaction chamber for directing gases exiting one exothermic reaction chamber to the entrance of the adjacent side-by-side exothermic reaction chamber.

32. (Withdrawn) A system as set forth in claim 27 wherein the combination reaction vessel includes an inlet opening communicating with a plurality exothermic reaction combustion chambers, and wherein the system further comprises a fuel cell stack having an anode exhaust line connected to the manifold to charge hydrogen through the manifold and a cathode exhaust line connected to the inlet opening of the combination reaction vessel to charge oxygen through the inlet opening.

33. (Withdrawn) A multistage combustion process to maintain a reformation temperature profile comprising:

providing a reaction vessel having at least two of spaced apart combustion chambers, and a reformation reaction chamber in between and separating the two spaced apart combustion chambers,

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charging reactants to the reformation reaction chamber to be reformed in the reformation reaction chamber in an endothermic reaction,

charging an oxidant into each of the combustion chambers and charging a combustion fuel into each combustion chamber at various locations in an amount sufficient to supply heat for the endothermic reaction occurring in the adjacent reformation reaction chamber and so that a substantially uniform temperature profile is maintained in the reformation reaction chambers.

34. (Withdrawn) A multistage combustion process to maintain a controllable reformation temperature profile comprising:

providing a reaction vessel having at least two of spaced apart combustion chambers, and a reformation reaction chamber in between and separating adjacent combustion chambers,

charging reactants to the reformation reaction chamber to be reformed in the reformation reaction chamber in an endothermic reaction,

charging an oxidant into each of the combustion chambers and charging a combustion fuel into each combustion chamber at various locations in an amount sufficient to supply heat for the endothermic reaction occurring in the adjacent reformation reaction chamber and so that a controllable temperature profile is maintained in the reformation reaction chamber.

35. (Currently amended) A fuel cell system comprising:

a reaction vessel including a plurality of vaporizer ~~section~~ sections for vaporizing a fuel and water mixture, and a plurality of heat transfer devices wherein each heat transfer device is ~~device~~ adjacent to ~~the vaporizer section~~ at least one of the vaporizer sections and wherein each vaporizer section includes a substrate shared by the adjacent heat transfer device ~~to supply a sufficient amount of heat to vaporize the mixture, and further comprising a plurality of endothermic reaction sections, and a plurality of additional heat transfer devices, wherein each endothermic reaction section has a heat transfer device associated therewith to supply sufficient heat to control the temperature profile of the associated endothermic reaction section within a predetermined range~~.

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36. (Currently amended) A fuel cell system comprising:

a reaction vessel including a plurality of endothermic reaction sections and a plurality of exothermic reaction sections, and wherein each endothermic reaction section has an exothermic reaction section associated therewith to supply sufficient heat to control the temperature profile of the associated endothermic reaction section within a predetermined range, and wherein each endothermic reaction section comprises a substrate shared by an adjacent exothermic reaction section.

37. (Original) A fuel cell system as set forth in claim 36 wherein the exothermic reaction section includes a catalyst therein for combusting a fuel.

38. (Currently amended) A fuel cell system as set forth in claim 36 wherein the exothermic reaction section is constructed and arranged to charge hydrogen and oxygen into the exothermic reaction ~~chamber~~ section.

39. (Currently amended) A fuel cell system as set forth in claim 36 wherein the exothermic reaction ~~chamber~~ section is constructed and arranged to conduct a preferential oxidation reaction therein.

40. (Withdrawn) A multistage heat generation process to maintain a controllable reformation temperature profile comprising:

providing a reaction vessel having at least two spaced apart heat generation chambers, and a reformation chamber in between and separating adjacent heat generation chambers,

charging a first group of reactants to the reformation reaction chamber to be reformed in the reaction chamber in an endothermic reaction,

charging a second group of reactants to the heat generation chambers to generate heat from an exothermic reaction of the second group of reactants in amount sufficient to supply heat for the endothermic reaction occurring in the adjacent reformation reaction chamber and so that a substantially uniform temperature profile is maintained in the adjacent reformation reaction chamber.

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41. (Withdrawn) A process as set forth in claim 40 wherein the reactants charged to the heat generation chamber comprises preferential oxidation reaction reactants.

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